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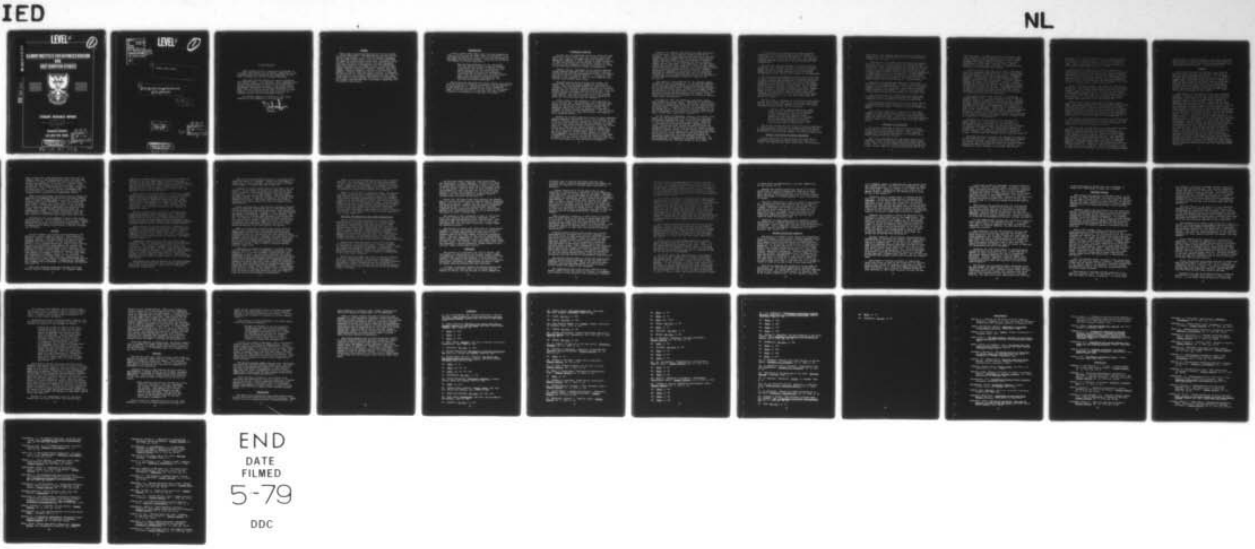

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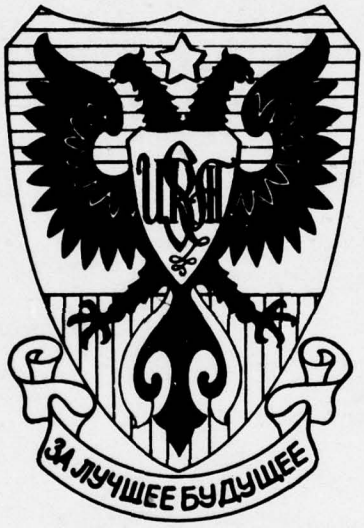

STUDENT RESEARCH REPORT

MAJ JOHN W. KNOX

SOVIET DOCTRINE AND CAPABILITIES FOR WINTER OPERATIONS

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FOREWORD

This research project represents fulfillment of a student requirement for successful completion of the overseas phase of training of the Department of the Army's Foreign Area Officer Program (Russian).

Only unclassified sources are used in producing the research paper. The opinions, value judgements and conclusions expressed are those of the author and in no way reflect official policy of the United States Government; Department of Defense; Department of the Army; Office of the Assistant Chief of Staff of Intelligence; or the United States Army Institute for Advanced Russian and East European Studies.

Interested readers are invited to send their comments to the Commander of the Institute.

ROLAND LAJOIE
LTC, MI
Commander

SUMMARY

This paper examines Soviet doctrine for the conduct of winter operations. The geographical location of the Soviet Union places it in a belt of climatic extremes, and its armed forces have a rich historical background of combat in severe winter conditions. Drawing on these sources, the Soviet Union enjoys a decided advantage over other nations in preparation for such operations. Topics discussed in this paper include historical background, special conditions, offense, defense, artillery support, engineer support, logistics, and training. In general, it may be said that winter warfare is regarded by the Soviets as a normal combat situation, but they are fully aware of the peculiar requirements arising under conditions of severe weather and strive to overcome them. As a result the Red Army has a formidable capability for all-weather operations.

INTRODUCTION

Soviet leaders feel their army is better prepared to fight in winter than any other army and, therefore, that the negative aspects of winter will be felt much more by the enemy than by Soviet troops. According to the Soviet 1939 Manual for Winter Operations:

> "The Red Army possesses all the advantages over the armies of other states in relation to practice and ability to operate in the harsh conditions of the winter period. The advantages flow from the geographic conditions of the USSR with its cold climatic belt, from the rich military-historical experience and better equipment of the Red Army for winter operations."[1]

Soviet military doctrine for winter warfare thus springs from two sources---historical experience and the geography of the Soviet Union. Therefore, to fully comprehend Soviet potential to wage war in the winter at the present time, it is necessary to be familiar with their recent historical involvements in this type of warfare.

HISTORICAL OVERVIEW

In the last two centuries the Soviet Union has been involved in three major conflicts in which winter has had a very dramatic influence upon the outcome. The Napoleonic campaign of 1812, the aptly named 'Winter War' of 1939 with Finland, and the German invasion of 1941 are all primary examples in which the effects of winter on military operations had enormous consequences.

General Kutuzov, Commander of the Russian Imperial Forces opposing Napoleon, who called Kutuzov 'the sly old Fox of the North'[2] considered the winter his staunch ally and called it 'General Winter'.[3] As seen by the results of the campaign of 1812, it was indeed an ally and one which Kutuzov used wisely.

Although several major battles were fought, the French were never decisively engaged by the Russian forces. Many have accused Kutuzov of indecision, even cowardice, for refusing to engage Napoleon in a decisive battle, but his attitude toward the matter was to let the weather destroy the enemy for him as he stated: "Our young hotheads are angry with the old man for curbing their desire. They do not reflect that circumstances alone are achieving more than our weapons."[4]

French losses in the campaign of 1812 amounted to half a million men, 160,000 horses, and 1,000 guns left behind in Russia[5] and Napoleon himself attributed the defeat to the rigors of the climate.[6] Further, Tsar Alexander upheld this view as, speaking of Kutuzov's triumph, he stated rather disparagingly: "The old fellow ought to be contented. The cold weather has rendered him a splendid service."[7]

Though the Russians used the climate to great advantage against Napoleon, the Soviets took a real drubbing at the hands of 'General Winter' during the conflict with Finland in 1939 as the Finns were trained and prepared to fight under the most arduous winter conditions while the Soviets were not. Expecting to overrun Finland in eight to twelve days, the Soviets found themselves bogged down in one of the worst winters since 1828.[8] For 105 days the world gaped at the Red Army's debacle in Finland. What happened? How could a force enjoying in some cases a superiority of forty to one in men, thirty to one in aircraft, and 100 to one in tanks and artillery fall flat on its face before an army the size of Finland's?

There is no question the purges destroyed the brains of the Red Army, and it was not properly trained or equipped. Many of the personnel had received no military training prior to combat,[9] and the soldiers were wearing summer uniforms.[10] When actually attacking or defending against the Finns, it was apparent the Soviet soldier simply did not know what to do.[11] Moreover, the Red Army's supply system broke down, especially north of Lake Lagoda, and lacking food, winter clothing, and shelter many soldiers froze to death.[12] Assessing Soviet casualties, Marshal Mannerheim, commander of the Finnish forces, estimated the dead at 200,000 and stated that most of these were wounded who froze to death because aid was not available.[13] In his memoirs Khrushchev placed the figure at one million.[14]

The impact of the Winter War on the upcoming German invasion of 1941 is noteworthy. It is said the bumbling of the Red Army before Finland delighted Hitler causing him to underestimate Soviet capabilities,[15] planning later to overrun the Soviet Union in eight to ten weeks.[16] The Soviet Union, on the other hand, licking its wounds, spent the next eighteen months digesting the lessons of the Winter War, training, and equipping its forces to operate under winter conditions.[17]

On June 22, 1941, the seemingly invincible German army invaded the Soviet Union. Advancing in three major directions---Leningrad, Moscow, and Rostov---the situation initially proceeded about as Hitler and the general staff had envisioned. Literally millions of prisoners fell to the German forces. The estimate of Russian losses by the end of September were two and a half million men, 22,000 guns, 18,000 tanks, and 14,000 aircraft.[18]

By the middle of September, however, the autumn rains began, and the Wehrmacht began to flounder in the mud. The Russian language even has a term for what happened to the trafficability of their road system. They call it 'rasputitsa' which means seasonal impassability of roads. The German army, losing the mobility which was a prerequisite for its blitzkrieg tactics, began by early October to exhaust itself. On the evening of 6-7 October the first snow of the season fell, and the Wehrmacht found itself without winter clothing---even antifreeze for the vehicle radiators was unavailable[19]-incapable of operations under conditions of the Russian winter. In early November the temperatures dropped below zero, and the German army was literally frozen in its tracks.

It is worthwhile to examine the German casualty figures for this period to understand the extent to which they were affected by the weather. For the first six months of the war in the Soviet Union the Germans suffered 900,000 casualties of which 228,000 were from frostbite![20]

By the first week of December the German army was exhausted, over extended, without reserves, and frozen before the gates of the capital of the Soviet Union. Robbed of its firepower and mobility by the winter, the Wehrmacht found itself with no means of reinforcement.

At this precarious moment in history the Soviets had at their disposal the uncommitted Far Eastern Front army of General Apanasenko consisting of Siberian divisions equipped and trained for winter conditions.[21] No other instrument could have been more suitable to the defense needs of the Soviet Union at that time. Thus, on the 8th of December, Siberian divisions, with skis, weapons which could be fired even at those temperatures, and tanks (T 34's) which were able to move in the snow, attacked the Wehrmacht in force and struck panic among the Germans.[22] For the first time the German army was forced to retreat.

Marshal Zhukov, commander of the Soviet forces before Moscow, later stated that he was asked many times after the war how the Soviets managed to withstand the German onslaught around Moscow, and he answered:

> "...Heavy losses, unpreparedness for combat under winter conditions, the stubbornness of the resistance of the Soviet troops sharply affected the enemy's combat capability...By the beginning of December he was exhausted and had no reserves, but by that time the Western Front had received two newly formed armies..."[23]

The Soviets repeatedly cite their historical experience in winter warfare, and from the examples given one begins to understand the extent of their involvement and the implications of severe winter weather for military operations.

SPECIAL CONDITIONS OF WINTER OPERATIONS

Winter operations on the Eurasian land mass may be characterized by harsh weather conditions such as extremely low temperatures, heavy snow falls, and blizzards.

Long nights, snow storms, and fogs reduce visibility for extended periods, and deep snow and ice create serious problems for movement.

Conditions of low temperatures and deep snow require much more effort from the soldier to perform the most ordinary of tasks, increasing the time needed for military activities. Under such circumstances prevention of cold injuries becomes a major problem, and should first aid be unavailable wounded soldiers freeze to death immediately in temperatures of -40 to -60 degrees. Plasma freezes at such temperatures, and should one touch bare metal without gloves he will leave his own flesh behind. Also metal becomes brittle and shatters if struck sharply.

Operating and maintaining vehicles is much more difficult in low temperatures. Engines start more slowly because of the higher viscosity of oil and fuel and the reduced capacities of batteries. They must be warmed before starting, and there is a greatly increased rate of break-down because of brittleness in the power train.

Deep snow reduces the effectiveness of mortar and artillery rounds. It also complicates the problems of camouflage and establishment of defensive positions.

Electromagnetic anomalies and storms disturb communications and complicate orientation by the artillery. Reduced visibility makes it harder to see and engage the enemy.

All of these conditions in addition to the normal dangers of combat make winter operations a very complicated and deadly business. Moreover, these conditions impact on virtually every major aspect of ground operations and are capable of producing more casualties than combat itself.

PERSONNEL AND EQUIPMENT

Of initial importance is the fact that the harsh conditions of winter impact quickly, heavily and dramatically upon the individual soldier. Thus, special equipment and techniques are required to enable him to survive and perform his mission.

The first prerequisite for individual protection is clothing. Soviet troops are issued heavy winter overcoats, hats, and in some cases fur-lined mittens and felt boots. Also, a special frostbite preventive ointment is issued to the troops for use on exposed portions of the

face and hands. In order to prevent frostbite of the feet, soldiers may be issued boots one size too large so that they may pad them with straw or, more likely, newspaper.[24] Further, special attention is given to maintenance of individual clothing, and it should always fit properly---not too tight or binding as this will cut off circulation of the blood.

Soviet doctrine calls for an enriched, high-calory diet, and commanders are instructed to provide hot food and drink whenever possible in the winter. Commanders are also responsible for the establishment of warming shelters. A two-layer, six to twelve man tent with stove is available for this purpose. Straw is stuffed between the layers for insulation. However, covered trenches and bunkers with doors, snow caves or ice huts, and snow or ice wind screens are all recommended means of providing shelter for the men. Commanders must also be careful to properly rotate troops who are on duty outside in order to prevent cold injuries and maintain the fighting strength of the personnel.

Individual mobility over the snow is frequently accomplished on skis. Every soldier serving in the far north or Siberia is expected to be able to ski. Soviet doctrine stresses the need for reconnaissance and advance engineer teams requiring good cross-country mobility to be equipped with skis, and commanders are required to keep on hand ski-equipped, highly mobile reserves to be used in the counterattack. Additionally, deep penetration units on skis will be included in the division's order of battle. These units can capture objectives in the rear of the enemy and destroy his major weapons, command posts, and logistical installations.[25]

Personnel is only one half of the equation for combat operations. The other half is equipment. In this respect, the Soviets have an ironclad rule for any modern weapon or vehicle; it must be able to operate in extremes of climate. "Thus the personal weapon in present use, the AKM, has few moving parts and the use of cold weather oil lessens the tendency of these to freeze. Machine guns are designed on the same principle."[26]

Vehicles operating in winter are affected in essentially two different ways. Extremely low temperatures freeze the cooling systems, raise the viscosity of fuels and lubricants, and lower the power output of batteries making engines extremely difficult to start and operate. Low temperatures cause gumming of the engine and serious

problems in the drive train due to poor lubrication and brittleness of the metal parts. Secondly, the mobility of vehicles is often reduced because of ice and deep snow. These difficulties can be overcome, however, and the Soviets expend much effort to do this.

Soviet doctrine calls for a complete process of 'winterization' to prepare vehicles for winter operations. This process includes increased driver training, adding antifreeze to the cooling systems, and changing to winter oils and fuels which allow starting at lower temperatures among others. For example, "MT-14p will start when the oil is at -20°C, and an engine using MT-16p will not start if the oil temperature is lower than -5°C."[27]

Even a different grade of fuel should be used during the winter. For tank engines "one uses diesel fuel grades DZ and DA. The freezing temperature of DA fuel is 15-20 degrees lower than that of DZ...If DA is not available, at temperatures below -30°C, it is authorized to use fuel T-1 or TS-1 (GOST 10227-62) or a mixture consisting of fifty percent of DZ fuel and fifty percent of tractor kerosene (GOST 1842-52) or T-1, TS-1 fuel."[28]

Special winter-type couplings are placed on fuel pumps, the engine heating and cooling systems, and exhausts. Also, the electrolyte density in batteries is brought to the winter level. The Soviets state that if a vehicle has been properly winterized it will start at any temperature.[29] It should be noted, nevertheless, that even with careful preparation of the vehicles for winter operations there will be a sharp increase in fuel consumption.[30]

The Soviets also use special heaters and warming covers to aid in starting vehicles in low temperatures. In addition, double windows in cabs and electric defrosters increase the utility of vehicles in winter.

Mobility over ice and snow is the other major requirement for vehicles involved in winter operations. A number of improvements and techniques are incorporated by the Soviets in this regard. Wheeled vehicles, especially those having only one driving axle, are equipped with chains and self-extracting devices. They are also placed behind tracked vehicles in the march column when possible. Bags with sand, mats, fascines, tow cables, chains, and pioneer tools add to the roadability and over-the-snow capability. Tanks are required to carry a log or beam for use as a dead man. The air pressure in tires is reduced giving them more traction, and treadway bridges

are included in the march columns. Moreover, the Soviet often include in their columns engineer assets such as tanks with bulldozer blades, snow moving equipment, and road graders, specifically to increase mobility.

OFFENSE

Soviet military doctrine stresses the offensive which in modern warfare is based on a high level of mobility and overwhelming fire power. It is, however, in these areas that the effects of winter are most readily felt, and while winter warfare is viewed as a normal combat situation by Soviet leaders, they admit that the most difficult conditions for engaging in military activities occur during this period.[31] They recognize both the negative and positive aspects of winter operations and strive to minimize the former while taking advantage of the latter.

Upon receipt of an order to attack, the commander performs a map and, if possible, a battlefield reconnaissance. Additionally, if the route of advance to the objective is long, reconnaissance elements are employed ahead of the main body. Their mission is to determine and mark the route of advance and to check the condition of the snow and ice cover enroute. During the commander's reconnaissance, he determines, among other things, the best route of advance and the positions for dismounting and putting on skis. He must be mindful of the fact that the distribution of snow is very seldom equal. Snow has a tendency to drift and pile up in uneven terrain. Thus it is almost always deeper at the base of hills, in depressions, ravines, gullies, and river bottoms than in open places or on the slopes and crests of heights. He must assure, in addition to cover and concealment, that he chooses the best possible route for cross-country mobility, and when choosing the point for dismounting he must always consider the depth of the snow in order to avoid unnecessarily tiring his troops. He should keep in mind at this time that the over-the-snow capability of the armored personnel carrier is less than that of the tank, and he should consider the means of movement to attack positions and during the attack itself. The commander should also consider the extent to which the enemy has taken advantage of the winter conditions in establishing his defense and the means by which his own unit will overcome these obstacles.

Concurrent with the commander's reconaissance, the unit begins preparations for the attack. The condition of weapons and the presence and serviceability of individual equipment are checked. Officers check to assure soldiers have warm clothing, boots, and camouflage cloaks. Weapons are completely disassembled and either lubricated with special winter lubricants or wiped completely free of all lubricants, depending on the temperature. Serviceability of skis and bindings is checked closely. When available, protective glasses and ointment for frostbite are issued. Additionally, time permitting, first aid procedures for frostbite are reviewed. At this time officers and NCO's may refresh the troops in mounting and dismounting with skis, putting on skis, and perhaps even have them practice being towed behind combat vehicles.

Also an attempt would be made at this point to provide the men with a hot meal. If the advance route is long, the commander should attempt to provide for warming tents and hot food enroute. At the very least, he should assure hot drinks during rest stops.

Individual weapons are wrapped in gauze while crew-served weapons are painted white and placed on specially built sleds and travois.[32]

Officers check to assure the proper preparation of vehicles and, in this respect, pay close attention to the presence and serviceability of all equipment to improve mobility over the snow.

The next phase of the attack is movement to the attack position. In most cases the platoon leaders and sometimes company commanders do not have maps. Thus, the route of advance must be carefully marked by stakes and other devices. The commander may also establish a system of traffic controllers to direct the moving elements and keep them on the assigned routes. Additionally, combat vehicles have rear outline lights which assist the drivers in maintaining proper direction and interval during periods of reduced visibility, and a system of visible light signals may be devised and employed.

Movement of motorized riflemen to the attack position will normally be accomplished in the armored personnel carriers, on tanks, or by towing behind tanks or APC's on skis or sleds. Towing, however, requires considerable expertise on skis, and personnel cannot traverse heavily broken or overgrown terrain. In some cases riflemen may

move to the attack position on skis, and, if the enemy's position is very close, they may move on foot. It should be remembered, however, that an attack on foot in snow 15-20 cm in depth is very difficult and in depths 40 cm or greater is impossible.[33]

In heavy snow, the motorized riflemen normally deploy as skirmishers and attack on skis.[34] In order to preserve their fighting strength, they may be towed behind tanks or APC's right up to the forward edge of the enemy's defense before deploying. However, a sufficient number of tracked vehicles is required to be on hand to accomplish this (a tank can tow two squads; an APC can tow one).[35] Again, the soldiers must be well trained in the use of skis and be able to overcome slightly broken terrain and obstacles while in tow. Soviet doctrine stipulates that well-trained soldiers should be able to cross trenches up to one and a half meters in width with no aid other than ski poles. Further, the soldiers are always expected to be able to fire their weapons from the march.

Infantry may also ride on top of tanks, but often there is no means to fasten the skis to the tanks. As a result, the troops may be forced to attack on foot in deep snow, tiring quickly and falling behind the attacking tanks. Therefore, embarking troops on tanks is used more often during pursuits deep into the enemy's rear.

The third phase of the offensive is development of the attack into the depth of the enemy's defense. This phase occurs after seizure of the initial objectives and as the enemy moves to secondary defensive positions or is in full flight. At this stage a commander may choose to place his troops on tanks or, should the trafficability permit, mount them in the APC's for an all-out pursuit. This occurs often if the enemy retreats along a road or smooth, ice-covered water course.

Soviet officers are aware that those conditions of winter warfare which are conducive to the achievement of surprise work equally in favor of the enemy. Thus in an attack against a well planned and executed defense a need exists for highly mobile reserves equipped with skis and tracked vehicles. Further, the commander is urged upon commiting his reserves to do everything possible to constitute another with equal emphasis on mobility.

In the winter offensive, Soviet tactical doctrine stresses the use of airborne and heliborne forces in

their traditional roles.[36] Normally these units will be dropped ahead of the advancing main body, seizing road junctions, bridges, airports and other vital points. Of primary consideration, in the case of airborne forces, is that they be dropped as close as possible to their objectives. This is much more critical under conditions of heavy snow cover. It is further recommended they be reinforced with engineer and artillery assets to increase their capability for independent action.

When using helicopters, personnel must be trained and expected to disembark from the aircraft without landing. This is normally accomplished in a valley or other place offering cover and concealment. Thus, the soldier may find himself leaping into a snow drift up to his neck. This tactic, on the other hand, makes it more difficult for an observing enemy to determine the purpose of the flight, and it helps prevent collisions among the disembarking troops. Of signal importance is the fact that soldiers disembarking from a helicopter must be very careful to avoid the rotor blades with their skis.

Helicopters may also disembark soldiers onto frozen lakes and rivers. If this method is used, a very thorough reconnaissance of the ice cover must be performed. Should this not be possible, Soviet doctrine advocates the use of explosives or bombs to blow holes in the ice to check its thickness.

DEFENSE

As with offense, the Soviets regard defense in the winter as a normal combat situation. They recognize the fact, however, that the "specific conditions of the northern regions of the USSR, where the layer of snow averages five feet or more, and the temperatures fall twenty to sixty degrees below zero, have a direct bearing, not only on engineering requirements, but equally on combat techniques to be employed."[37] For instance, the presence of frozen ground, heavy frosts, deep snow cover, and numerous snow falls increase the amount of work and time required to prepare a position. On the other hand, the "abundance of marshes, lakes, rivers, hillocks, and other difficult terrain features, coupled with the deep covering of snow, permit an organized defense utilizing smaller forces than usual. Consequently, frontages for a company may be extended to 1,500 meters and possibly even more."[38]

This often produces large gaps between units and creates special defense problems. For example, enemy

penetration between units is facilitated and forces the defense to pay particular heed to this possibility. In order to prevent this, Soviet doctrine stresses the use of two and three man combat patrols on skis or tracked vehicles between units. Also, weather permitting, helicopters are used to observe the flanks, rear, and approach routes into the position.

The dispersal of forces makes it difficult to support each other by overlapping rifle fire as this will often be well beyond the maximum effective range of rifles. Thus, it becomes of paramount importance that tanks be attached to the defense in order to cover the gaps with direct, overlapping fire. Additionally, the intervals must be covered by on-call artillery fires, minefields, and other obstacles which are created to impede the enemy.

Often a sub-unit will find itself fighting alone without any support from its parent unit. Should an enemy penetration begin to develop, Soviet doctrine states that the units on the flanks should hold in place bringing all available fire upon the penetration in order to hold up the enemy's advance pending a counter-attack by mobile reserves on skis and tracked vehicles.

When selecting a defensive position commanders are reminded to pay attention to the snow cover. Snow will be deeper in depressions and gullies, and these may be used to canalize the attacking enemy forces. Also, commanders should cover 'roads, junctions, forest areas, and populated localities which are generally the enemy's favorite targets."[39]

Commanders should also be aware that many water obstacles which are impassable in summer become passable in winter. Thus rivers and lakes might cease to be obstacles to the advance. However, the defense can utilize the sharp banks of rivers rendering them impassable to vehicles by increasing the slope or simply pouring water over them, thus creating slippery ice barriers passable only to troops on foot or skis. Additionally, explosives may be used to create gaps in the ice on lakes and streams.

The defense can also be improved by building bulwarks of ice and snow as barriers and to prevent observation. This type of construction is very easy in deep snow during low temperatures.

When entrenching during the winter, snow depth should always be taken into account. "Where the snow depth is three feet or more, trenches and communication trenches with parapets of packed snow can be dug."[40]

Digging in frozen ground requires much more time and effort. If the ground is frozen to a depth of no more than 6-8 inches, snow plows and excavators may be used to entrench. If it is frozen deeper, explosives must be used to render the ground friable, and, once the work has been started, it must be finished or the ground will freeze solid again. The Soviet army maintains that a four man slit trench takes four hours to prepare using explosives.[41]

After construction of the fighting trenches a warming trench is normally constructed six to eight meters away. It is enclosed and a heater is provided. Time permitting, it will be connected by a passage to the fighting trenches. The danger of frostbite, however, is ever present, and the Soviets have several other methods of providing shelter. In addition to portable tents designed especially for that purpose, dugouts, temporary huts, various types of screens, and even snow caves or ice huts are used. Soviet doctrine repeatedly advocates the use of field expedient methods to provide shelter and warmth.

When in a defensive position every effort must be made to provide hot meals, and during periods of low temperatures soldiers must be rotated more frequently. During World War II, the Soviets kept one third of their strength outside and still consider this sufficient today.[42] However, during periods of extremely reduced visibility, Soviet doctrine requires that at least 50% of personnel be on duty in the fighting trenches with more frequent rotation of troops. This is done to protect against surprise enemy raids.

Camouflage receives much emphasis in current Soviet tactical doctrine. This is especially important in the defense as it is easier to detect targets against the background of snow. To this end, personnel are issued camouflage cloaks, weapons and vehicles are painted white, and surfaces darkened by muzzle blasts and wheel or tank tracks are covered with fresh snow. Whenever possible, vehicles use folds and dips in the terrain for protection, but often tanks and APC's must be entrenched and camouflaged on the forward edge of the defense. Additionally, great effort is spent in the construction of false defensive positions to deceive the enemy. This is especially true in areas of deep snow cover in which this type of work can be swiftly and easily accomplished.

Aware of the difficulties which may arise concerning supplies, the Soviets try to provide additional stores of food, fuel, and ammunition to the forward defensive areas. They plan to rely heavily on resupply of forward and isolated units during times of poor road conditions or during the spring thaw by means of helicopter.

When in contact with an advancing enemy, the Soviets will make every effort to force him to "fight on open, snow-covered ground and in frosty weather, all of which will create favorable counterattack conditions."[43] They intend to do all possible to assure that the winter conditions assist them in defeating the enemy. They estimate, however, that due to the greater requirement for defense in all directions created by the greater dispersal of units and the increased effort required to entrench, it will take them three times longer to prepare a position for defense in the winter than to prepare the same position in the summer.[44]

TACTICAL RECONNAISSANCE AND COMBAT INTELLIGENCE

Terrain and weather conditions of northern areas greatly affect the conduct of tactical reconnaissance and combat intelligence gathering activities. Long periods of reduced visibility and mobility call for extraordinary techniques, preparation, and attention to detail. Heavy snow cover often hampers or prevents the use of wheeled vehicles by reconnaissance elements, especially while moving off the road. As a result great emphasis is placed on equipping these units with skis, tracked vehicles, and helicopter assets. Even the use of dog and reindeer sleds is advocated for enhanced mobility.

Winter conditions seriously increase the problem of orientation, and much individual and unit training is centered on navigation by compass. Additionally, routes for raids and ambushes are sometimes reconnoitered beforehand and marked by stakes and lines for guidance. This is done often when a raid or ambush is planned over a relatively short distance.

During the long summer day there is greater reliance on aerial reconnaissance. The obvious advantages of this type of observation are the vastly increased distance and speed of target acquisition and the discovery of targets not visible to observation from ground locations---those situated in folds in the terrain and on the reverse slopes of heights.

On the other hand, during the long winter night, the importance of raids, ambushes, and electronic means of intelligence gathering increases. There is also an increased use of listening posts which are placed close-in to the enemy's lines in order to gain information on the movement of tanks from the rear to the front, the relief of troops, the occupation of the front lines by infantry, and the construction of engineer works to include false positions and barriers.[45]

Night, fog, and heavy snow falls enhance the concealment of raids and other sorties enabling them to penetrate deeply into the rear. These are used to capture prisoners and seize documents, weapons, and new types of equipment. During World War II, of 333 reconnaissance missions conducted during a one month period, 227 or sixty-eight percent were raids[46] The Soviets are still making use of this data in their training today.

The obverse of this situation is that in the winter units will normally be more widely dispersed, often with wide gaps separating one unit from the next. This creates a need for surveillance not only to the front and flanks but also the rear, requiring a larger number of observation posts.

The Soviets are aware that difficulty of cross-country movement in winter and adverse physical and electrical effects of extreme meteorological conditions in the northern regions seriously hamper battlefield reconnaissance. They are also aware of the serious consequences which arise when commanders of units are ignorant of the particulars of topographical relief and enemy dispositions in their areas. As a result, they expend much time, effort, and resources to ensure successful accomplishment of the tactical combat intelligence mission.

ARTILLERY

The Soviets call artillery the "God of Battle", and even today its importance to the success of past combat is underlined in their military writings.[47]This particular branch of the combat arms, however, is also known as the "arm of precision" as the ability to loft an artillery projectile a distance of twenty miles and have it land on target requires precise data and conditions.

In order to properly support the ground gaining arms with accurate and timely fire, the artillery must be equally as mobile, but the effects of winter impede the

artillery just as they do the other branches, and diligent effort, detailed reconnaissance, and expert preparation are required to overcome these obstacles to movement.

Proper occupation of firing positions is very important in the artillery, and prior to each occupation a thorough check of the area must be performed. Extremely rough terrain, large rocks hidden by the snow, non-freezing swamps, and permafrost are all factors which complicate the procedure. For instance, when setting up in deep snow, it may be easier to place the guns on the snow itself and erect parapets five to six meters in width for protection of the guns and crews.[48] If, on the other hand, a position is selected on frozen ground, a great deal of work with explosives is necessary, and most of the preparation must be accomplished before bringing in the weapons.

When occupying a position, a good system of drainage must be established in the areas in which ammunition is to be stored. To protect the trail spades when firing, so they do not break, logs and beams should be used, especially when operating in broken or rocky ground. Also, the spades should be covered with a thick layer of gun grease or solidol to keep them from becoming frozen in the ground.[49]

Grid coordinate location and azimuth are critical requirements for accurate fire, but the problems of artillery survey in deep snow and poor visibility during the winter are multiplied. Taping distances in deep snow to a distant aiming point is very difficult and sometimes impossible. It is recommended, therefore, that distances be determined using a short base or a non-base range finder. Also recommended is the extensive use of mobile spot heights installed on tractors with good cross-country capability. With regards to azimuth, the Soviets prefer the gyroscopic method of determining it, but the adverse meteorological conditions do not altogether preclude the use of astronomical observation.[50]

The quickly changing weather conditions require more frequent meteorological messages to the artillery for computation of firing data. These also serve as storm warnings, reducing the possibility of cold injuries to the troops and damage to the equipment.

Low temperatures have very serious effects on the weapon itself during the conduct of firing. For example, the viscosity of the liquid in the recuperator increases

creating greater pressure while at the same time the friction of the tube along the gun cradle increases. As a result, the howitzer may be easily damaged in recoil by the shock against the gun carriage or in counterrecoil as the tube slams back into battery. Because of this, it is recommended that firing be initiated at the lowest possible charge or that an artificial recoil be accomplished prior to firing.[51]

It is critical that all lubrication be removed from the bore before shooting. In conditions of low temperatures even a thin layer of 0.1-0.2mm will cause a leading strip to build up before a moving projectile reducing its speed through the tube. The result is a sharp increase in the pressure from the powder gases which can cause the tube to swell and may result in an explosion of the projectile inside the howitzer. Hoarfrost may also build up in the tube creating a similar but more dangerous situation. So, each tube must be checked before firing. Oblique light directed into the chamber should be used as this is often impossible to detect using direct light.[52]

All storage lubricant must be removed from the projectile. Failure to do this results in very erratic ballistic action resulting in an unacceptable circular error of probability. Special brass, steel, and wooden scrapers are available in Soviet units for this task. The projectiles may also be wiped with rags moistened by kerosene or diesel fuel and then wiped clean with a dry rag.[53]

During firing of semi-fixed ammunition, the hot cases landing in snow in the gun pit will cause it to melt and subsequently freeze on the cases. This must be removed before packing the empty shell in the case and sending it to the rear. It is very time consuming and may be prevented by placing mats or planking in the pit at the rear of the howitzer.

Artillery optics and angle measuring instruments may fog up or get a layer of ice inside in periods of low temperatures. This must not be removed by steel brushes or by heating the instrument as they are easily damaged. If the condition is on the outer surface of the lens, it may be removed by wiping with a dry cloth. To reduce or prevent this situation, these instruments must not be brought into and out of heated areas, must not be breathed on while in use, and must be protected by covers. When in camp, they should be stored on racks

in areas which are maintained at the same temperature as the outside air.[54]

Because the casualty producing radius of artillery projectiles is greatly reduced when bursting in deep snow, and the ammunition handlers in the battery must wear mittens or thick gloves, the rate of fire is slowed while the number of rounds expended in each fire mission is larger.

Artillery observation in the far north is also affected. Objects are seen more clearly and easily against a snowy background in the night as well as the day. As a result, distances are difficult to determine. Also, orientation points such as the 'bright green bush' or the 'yellow hill' of summer are not available in the snows of winter; therefore, orientation points which silhouette themselves against the sky such as tall trees or peaks are normally used.

Observers in these areas are often markedly sluggis. and sleepy with a reduced keenness of vision because of insufficient ultraviolet rays, and they must be artificially irradiated. Also a temporary increase in the sharpness of vision may be obtained by a preparation of cola, glucose, and vitamin A.[55]

NUCLEAR BIOLOGICAL CHEMICAL

The ability to conduct winter operations successfully in an environment of mass casualty weapons demands strict attention to protective measures and considerations. In this regard, Soviet doctrine begins by underlining the proper use of the terrain for protection of vehicles and personnel. It states that folds in the terrain reduce damage from nuclear explosions by one and a half times. Further, all casualty producing effects are reduced by forests, especially coniferous. Reverse slopes of hills, gullies, ditches, and depressions are all subjected to less radioactive contamination. Soviet doctrine states that the level of radiation in bomb craters formed in the snow after the track of a radioactive cloud is ten to twelve times less than in the open and in a coniferous forest as much as one and a half to two times less.[56]

More active measures for protection can be taken by using snow, ice, and frozen ground while constructing fortifications. To reduce gamma rays by one half requires three to four inches of frozen earth, 10 inches of ice, or 20 inches of packed snow. As for residual radiation,

it is somewhat easier to decontaminate open spaces which are covered by snow. For this it is necessary to remove the contaminated snow to a depth of two inches and place it to the side. Clearing an area with a radius of 15 meters causes a reduction of the radiation by a factor of two in the center.[57]

Radiation from a nuclear blast is reduced during a snow fall. Secondary contamination of personnel and equipment, on the other hand, may result from blowing snow when a burst occurs, but a snow fall on top of a radioactive area reduces the radiation. Soviet doctrine states that vehicles and personnel should be decontaminated as soon as possible, especially before any snow has a chance to melt and freeze again, forming a contaminated layer of ice which is much more difficult to remove.

Chemical and biological agents are generally more persistent in the winter due to low temperatures. This increase is reflected as follows: in the case of gas vapors, a reduction in the temperature of ten degrees increases the persistence of toxic chemical agents two times; in winter the casualty producing qualities of Zarina and mustard gas are maintained for as long as a week; and, those of V-gas may persist until the onset of spring.[58] Also, snow contaminated by chemical or biological agents may be covered by fresh snow, and troops may be exposed when entrenching.

Nuclear, chemical, and biological reconnaissance is accomplished at battalion and company level using detection kits which are normally stored in the commander's vehicle or command post. Soviet doctrine requires at least two observers wearing individual protective equipment be positioned on the upwind side of a unit in an area which affords them a good view. They periodically test for signs of contamination, and during overflights of aircraft, bursting of artillery shells, or nuclear blasts they must increase their checks. The air must also be checked when weather fronts move through the occupied area.

The problem of warning personnel is complicated during the winter as many of the troops will be wearing thick winter clothes or located in vehicles or other warming shelters all of which may hamper hearing; therefore, the Soviets use a variety of systems including duty personnel in each troop location to alert the men.

Individual protective equipment includes protective raincoats, overalls, gloves, socks, and boots. Additionally, the Soviet protective mask is fitted with warming cuffs and protective lenses. Much of this equipment is made from rubber or rubberized materials which become hard and brittle in low temperatures. As a result, it should be stored in warm areas. Because of the difficulty of donning protective gear over winter clothing, the Soviets issue it in one size larger then would normally be worn.

When wearing the protective mask for long periods during the winter, there is great danger of frostbite on the face around the line of obturation; therefore, the mask should be removed periodically and the face massaged. Should this not be possible, the area of skin affected should be lightly coated with a layer of grease or glycerine and massaged periodically through the mask.[59]

At low temperatures ice may form inside the protective mask, especially in the breathing valves. It is imperative they be wiped dry whenever the mask is removed. Sometimes, to prevent freezing, the mask must be carried inside the overcoat.

Decontamination of men and equipment receives high priority in Soviet doctrine, and much use is made of local materials such as tree branches and fresh snow as field expedients for cleaning. Moreover, many chemical and mechanical means of decontamination are located in each unit, and the men must be proficient in their use. Heat from engine exhausts is used to melt snow when liquid solutions are needed or when hot water is required for decontaminating men or equipment.

Personnel who have participated in decontamination procedures must not be allowed into a warm area before removal of their protective gear as the contaminant may become gaseous spreading to other equipment or personnel. Instead, they must carefully remove their protective clothing, shaking or cleaning any possible contamination from them, and carefully fold and stack them outside.[60]

The Soviets are very serious about operations in an NBC environment and expend much effort to assure their capability in this area. Without a doubt, their military literature shows this concern and indicates this as an area of clear superiority over the armies of the West. Moreover, the fact that winter complicates this activity

is not considered by Soviet military leadership to constitute a deterrence to their use in combat.

ENGINEER SUPPORT

The Soviets rely heavily on engineer support in the conduct of combat operations, and basically that support is the same in winter as it is at other times of the year. As with the other branches of arms, however, the severe weather and other special conditions of winter complicate engineer activities requiring greater effort and more assets.

Engineer support may be divided into two broad categories of offensive and defensive activities and may be further sub-divided within these divisions into other categories for more precise inspection. For example, engineer activities during the offensive include engineer preparation of the assembly areas, preparation of routes of advance, preparation of passages through obstacles, reconnaissance and preparation of river crossings, and assistance to the maneuver elements increasing vehicle mobility.

Work in the assembly areas is primarily concerned with preparation of warming shelters and cover for personnel and vehicles. For the protection of the troops, trenches and bunkers may be constructed using snow and frozen soil. For tanks, artillery, and armored personnel carriers cover is made from snow using bulldozers, snow plows, and other snow clearing equipment. Command posts, medical aid points, and other administrative locations are set up in warming tents or facilities made of ice blocks or wooden panels. Mobile, prefabricated shelters for six men are also available. These consist of two layers of material with insulation between and a small stove. They are transported on sleds towed behind tracked prime movers and established in depressions in the snow.[61]

From the assembly areas, engineers often reconnoiter, prepare, and mark the routes of advance. Sometimes these routes must be capable of supporting movement of materials to the forward edge of the defense. For this purpose the engineers normally use tanks and prime movers with bulldozer blades attached.

The creation of passages through obstacles is an important engineer task. In the winter it is critical that the depth of snow be considered. In a snow cover

to a depth of 50-60 cm, a passage through a minefield may be made with explosives. The resulting explosion clears the snow away to the ground, and the mines are either exploded or cast to the side. The width of the resultant passage is somewhat less than in the summer, requiring the use of still more explosives. Also, a passage may be constructed using vehicles equipped with bulldozer blades, and as a last resort troops mounted on skis using probes and mine detectors may clear the passage.[62]

Engineer support to the mobility of the offensive consists mainly of reconnaissance, construction, and maintenance of roads and river crossings. The missions of the reconnaissance units are accomplished on skis and in vehicles having high cross-country capabilities.[63] In addition to reconnoitering the route, engineers must check the depth and density of the snow cover. They must also check the load carrying capacity of the ice enroute.

The preparation of roads in the winter for routes of advance is accomplished by detachments specially designated one to each route.[64] These detachments vary in personnel and equipment depending on the importance of the mission, nature of the terrain, and the amount of forces available. However, the basis for these detachments is the road unit equipped with snow removal vehicles, bulldozers, and road graders.

Soviet experience has found that in conditions of deep snow it is better to prepare two traces for each march route---one for tracked vehicles and one for wheeled.[65] For those routes designated for tracked vehicles, the snow will be removed only on steep grades and those sectors with a snow depth greater than one meter. For wheeled vehicles, the snow should be removed to the ground as this will provide better traction. Following passage of the snow removal equipment, one or two squads of troops cover the same route throwing dirt or sand on the road to further improve road traction.

Routes constructed from packed snow may be established when the snow depth is greater than 70-80 cm and the temperature holds at -5°C or less. This is accomplished by packing the snow in layers. Routes can also be made through deep snow simply by running a tracked vehicle over the route several times, packing the snow.

Engineer units may be attached directly to maneuver battalions to increase their ability to move in the winter. In one recent training exercise a motorized

rifle battalion was reinforced with a combat engineer platoon with snow moving vehicles and a tank-chassis mounted MTU bridge layer.[66]

The Soviets attach great importance to assault river crossings, and their engineer capabilities in this area are formidable. They find, however, river crossings in the winter are often easier than in the summer. At minus ten degrees Centigrade and an ice thickness of 68 cm combat vehicles weighing fifty tons and maintaining intervals of not less than forty meters may safely cross a river.[67]

The successful crossing of a water barrier over ice requires a precise reconnaissance of the approaches, exits, and ice conditions. Should the ice not be thick enough, it may be reinforced in various ways. An additional layer of ice may be added up to 60% of the thickness of the ice present by pouring water on the surface and allowing it to freeze, or it may be strengthened using wooden panels or logs or both.

If it is impossible to cross on the ice, the engineers will build a bridge. This is accomplished in several ways depending on the width of the obstacle and the thickness of the ice. For example, if the ice is more than 30 cm thick, the bridge may be assembled on the ice, and then the ice is ruptured with explosives allowing the bridge to settle in the water. On the other hand, a channel may be blown in the ice and the bridge assembled in the normal manner. On rivers up to 100 m wide with gentle sloping banks, the bridge may be assembled on the bank and using cables towed across the ice. With larger bridges, the Soviets start in the middle and build toward both sides quickening the pace of the work by 50 to 100 percent.

Engineer support of the defense in the winter is concerned with the construction of fortifications, routes of maneuver, obstacles, and the camouflage of the troops.[68] Deep snow and frozen ground render it almost impossible to entrench without engineer help. If the ground is frozen no deeper than 15 cm and there is little snow cover, the fortification of positions is accomplished much the same as in summer. However, the time necessary for this will be increased by 30-40%. The most unfavorable conditions for fortification of the defense are encountered in deeply frozen ground with little snow cover.[69]

Initially the fighting trenches are prepared. If the trenches are to be in frozen ground, the snow cover is removed. If the ground is frozen to a depth of 15 cm or less, mechanical excavators and entrenchers can do the work with no help. If the ground is frozen deeper, explosives must be used. Afterwards excavators can be used, but pieces of frozen dirt often clog the blades slowing the work.[70]

In a situation with a snow depth of 40-60 cm and ground frozen less than 10 cm, the trenches will be dug half in the snow and half in the ground. The shoulders of the trench will be fortified with dirt and then covered with snow. In snow depths greater than 80 cm the trenches will be built completely in the snow with the lips of the trenches reinforced with packed snow three to four meters thick for protection from bullets and shell fragments.[71]

Upon completion of the fighting positions the engineers assist in the construction of warming shelters. These are usually warming trenches with doors and stoves located six to eight meters behind the fighting trenches and connected to them by tunnels. The engineers also assist the soldiers in the construction of ice caves, snow huts, and wind screens.

Intervals between units must be covered by engineer obstacles. These may be minefields designed to retard tanks and infantry, or they may be carefully concealed barriers against skiers. Another Soviet tactic is to have the engineers bury explosives in deep snow to be exploded when reached by the enemy.

It can be seen the Soviets expect and receive much help from their combat engineers in order to prepare the defense in winter. However, they underline the fact that with all the engineer support to include explosives, mechanical entrenching machinery, and heavy snow removal equipment, establishment of the defense in winter will, nevertheless, consume much more time, effort, and resources.

LOGISTICS

The Soviets are well aware of the logistical problems associated with combat operations in winter and have taken measures to cope with them under the increased demands of modern warfare.

To alleviate this problem, Soviet doctrine calls for moving stores of supplies forward in the offensive and stockpiling of necessary items in defensive positions. Further, they stress proper maintenance of roads by snow removal equipment.

Beyond doctrine and road maintenance, however, the Soviets have done much to increase the ability of their carriers to operate in the extremes of winter.

> "During the winter of 1966-67 tests were conducted in the far north of two experimental prototypes of Ural-375K trucks, specially designed for operations under Arctic conditions. The following equipment was installed on these vehicles: prestart heater P-100 (17,000 kilocalories/hr), curtains instead of louvers on radiators, an insulating layer of polyurethane foam, a cab with double glass, an independent 0-30 heater; insulated batteries, cold resistant tires and other rubber products and specially isolated electrical wiring. Oils and lubricants assuring normal operation at temperatures down to minus sixty degrees Centigrade were used...Tests were conducted at temperatures of minus fifty to sixty degrees Centigrade."[72]

The ZIL-E167 has the following characteristics: "maximum road speed with full load of 5 tons, 65 km/hr, range on road 900 km, depth of snow negotiable 1.0 meter, speed on 0.8 m deep fresh snow 15 km/hr, maximum grade negotiable 40 degrees."[73]The ZIL-135 general purpose vehicle has similar operating characteristics; however, it can carry a 10-ton load or pull an 18-ton load. These two vehicles (ZIL-E167 and ZIL-135) have an excellent off-the-road capability. Also, these are just several of a whole series of vehicles which the Soviet Union has tested in the last 10-20 years which indicate their efforts toward increased all-weather, all-terrain logistical capability. Additional vehicles include the AK-30, a propeller driven craft with a rated speed of 100 km/hr on snow,[74]and the TP-90-amfibiia tractor which can travel over swamps and marshes, in deep snow, and on rivers and lakes.[75]

Because of the undeveloped nature of the Polar regions and the Soviet Far East, the Soviets rely

heavily on air transportation. They have a highly increased capability in this regard with their expanding fleet of cargo aircraft and helicopters. Soviet doctrine calls for expanded use of these assets for resupplying of units under winter conditions. They stress the use of frozen lakes and streams as landing areas for aircraft and helicopters, and they have improved the all-weather capability of their airfields with the introduction of special equipment for snow removal and techniques for airfield maintenance in the winter. A rotary worm-type snow plow mounted on a Ural-375 truck of high cross-country capability can move up to 1,200 tons of snow per hour.[76] Also, jet engines are mounted on trucks for blowing runways clean and melting ice and snow.[77] Soviet doctrine also requires that equipment for maintaining airfields be winterized in October and then kept in heated stalls for ease of starting and maintenance.[78]

With such emphasis as noted above, the Soviet capability to resupply its armed forces under conditions of the most severe winter weather cannot be seriously doubted. To the contrary, it is probably equal to or greater than any other country.

TRAINING

The Soviets feel that field training in all types of terrain and weather under realistic conditions is the best method of preparing troops for combat. This applies especially to winter operations. Extreme cold and deep snow make no difference, and training is conducted regardless of the conditions.

Soldiers serving in the Siberian Military District are expected to become inured to the climate, and great importance is attached to hardening the young soldiers physically. Additionally, every soldier must know how to ski, and each one does at least 500 km on skis annually.

> "That distance includes all marches out to the field for training in tactics, topography and firing, as well as to camps and training centers. The twenty-five to thirty minutes daily morning exercise is also used for ski training. Some units plan two to three day skiing outings over distances of one hundred fifty to one hundred eighty kilometers."[79]

Soviet troops are expected to be able to ski independently or in tow for long distances, and they are

taught to use and maintain their individual equipment. They are also instructed in various field expedient methods of providing protection and shelter. In this regard, field training is carried out in all temperatures.[80]

The training of driver-mechanics for winter operations also receives emphasis:

> "Classes are devoted to the peculiarities of operating and driving the equipment, safety measures, the procedure for removing equipment from mothballs, and a check is carried out to see how the students have assimilated the material taught. Those who fail to pass the quiz are not allowed to operate the equipment."[81]

Drivers are taught to maintain, start, and operate vehicles under the coldest of temperatures. Afterwards, they are given practical training in the field. This includes specific instructions for driving in deep snow and on slippery, ice covered surfaces. They are taught to choose routes with the least amount of snow and to avoid, when possible, steep, long ascents. Also, they are given detailed training with devices and techniques which increase the cross-country mobility of their vehicles.

The Soviets produce combat vehicles with outstanding cross-country and over-the-snow capabilities, but they are aware that maximum utilization of these machines can only be obtained with properly trained drivers. They know that lack of preparation here will certainly impede their forces later on when engaged under winter conditions on the modern battlefield.

Unit training is realistic, and regular field exercises are conducted testing the capability of operating in the winter. Soviet leadership considers this necessary to instill the proper level of confidence, morale, and expertise in the soldier to harden him and enable their forces to conduct winter warfare successfully.

CONCLUSIONS

The Soviet Union maintains large armed forces which receive the lion's share of the nation's resources. These forces are in an on-going process of modernization, and

great emphasis is placed on their combat readiness and ability to engage an enemy under all circumstances.

Twice in recent history the Soviet Union has been engaged in a life-and-death struggle in which the severe weather of winter played a large role in the final outcome. This historical perspective and the constantly renewed awareness of winter conditions caused by the geographical location of the country combine to become the motivating force behind Soviet preparation for the conduct of winter operations. The attitude of Soviet military leaders toward the conduct of field training and the length of the Russian winter virtually assure combat training under the most arduous circumstances.

The strong emphasis which winter operations receive in Soviet military writings and the successful conduct recently of major military exercises in the dead of winter lead inescapably to the conclusion that Soviet armed forces are capable of successfully conducting such operations in a modern war. Given their attitudes toward war-winning capabilities and the opportunity to prepare in such an extreme climate, it is altogether likely that the Soviets do, in fact, enjoy a superiority in this area over the military forces of any other major power.

FOOTNOTES

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